TECHNOLOGY TRANSFER AS APPLIED TO GOVERNMENT SERVICE EMPLOYEES OF THE NAVAL FACILITY ENGINEERING COMMAND AND COMPARED TO NAVAL OFFICERS OF THE CIVIL ENGINEERING CORPS

Steven Hurley Claassen

Library
Naval Postgraduate School
Monterey, California 93940

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

TECHNOLOGY TRANSFER AS APPLIED TO
GOVERNMENT SERVICE EMPLOYEES OF THE
NAVAL FACILITY ENGINEERING COMMAND
AND COMPARED TO
NAVAL OFFICERS OF THE CIVIL ENGINEERING CORPS

by

Steven Hurley Claassen

Thesis Advisor: J. W. Creighton

September 1973

T157082

Approved for public release; distribution unlimited.

Technology Transfer as Applied to Government Service Employees of the Naval Facility Engineering Command and Compared to Naval Officers of the Civil Engineering Corps

by

Steven Hurley Claassen
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1964

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN OPERATIONS RESEARCH

from the

NAVAL POSTGRADUATE SCHOOL
September 1973

Thes
C479
c.1

Library
Naval Postgraduate School
Monterey, California 93940

ABSTRACT

It is hypothesized that there is a relationship between the efficient utilization of research and development, and the behavioral characteristics of individuals in an organization which uses the research. A modified version of a previously developed psychological test for Naval Officers is used to determine the natural ability of Government Service Employees of the Naval Facilities Engineering Command to transfer technical information and bring about its adoption. Emphasis is placed on locating and understanding these individuals to improve the efficiency of technology transfer. A comparison is made between the Government Service Employees queried and the previously tested Naval Officers.

TABLE OF CONTENTS

I. PREFACE

Probably one of the greatest shortcomings of mankind is his lack of ability to make the best use of the resources at his disposal. With the relatively recent technological boom, vast amounts of extremely useful information have been fundamentally researched and partially developed, but not introduced into industry or put into productive use. In many instances applied research may not have been considered for use because the fundamental research results were simply not known to potential users. A gap has resulted between the researcher and the user, and much of the knowledge resource is left unused. The subject of technology transfer has become more important as the information gap between the source and the user of knowledge has expanded. Methods of reducing this gap or at least understanding its existence have also grown in importance.

II. INTRODUCTION

The ever increasing cost of fundamental research makes it advantageous to make efficient use of information being developed. The lack of communication between the suppliers and users of technical information is directly responsible for what Havelock terms "the knowledge gap" [Ref. 1]. The existence of this knowledge gap was apparent in the Naval Facilities Engineering Command. Although several methods of accomplishing technology transfer are commonly used, such as formal documentation, written dissemination, books, magazines, and instructions, it is generally agreed that a more efficient method is available. Specifically, concepts established by Havelock, Rogers and Shoemaker, and Gilmore, as well as others listed in the bibliography, indicate that information passed by individuals through personal contact is of primary importance. It is beneficial therefore to develop the people-aspect of the technology transfer process. Additional alternatives to increase the flow of knowledge can be provided. This can be done by establishing the existence of and identifying individuals with natural behavioral characteristics to link the supplier and user of technology. The purpose of this work is to extend previous technology transfer research done by Creighton, Jolly, and Denning [Ref. 2] on Naval Officers in the Naval Facilities Engineering Command to Government Service Employees in the Naval Facilities Engineering Command.

The first objective is to characterize those individuals within the sample who assume a linking position between the source of technical information and its supply. A second objective is to compare the two respondent groups to establish similarities and differences between them. The last objective is to establish whether or not these individuals, once identified, would have similar aspiration levels and length-of-time-in-position characteristics.

III. CONCEPTS

"Technology transfer" as defined by Rogers and Shoemaker [Ref. 3, p. 2], is "a purposive, conscious effort to move technical devices, materials, methods, and/or information from the point of discovery or development to new users". The definition, expanded over the definition more generally used in the literature, includes not only technological innovation, awareness and presentation of new ideas, but also acceptance and implementation. Lesher and Howick [Ref. 4, p. 35] also address the idea of implementation as well as acceptance when they include in their definition of "technology utilization" a requirement for adaptation by the user.

In this research, only the person-to-person aspect of technology transfer is being investigated. People who are likely to perform the technology transfer function have been determined to be more than just people who are interested in new ideas and implementation. Innovation, willingness to accept risk, and an active involvement in more than one discipline are important characteristics. A person who has these characteristics is identified in this work as a Linker. Formally, a Linker is defined as an individual who through his own initiative seeks out scientific knowledge, is an early knower of innovation, and acts as an intermediary between the source of knowledge and the individuals or

organizations who put it to use. Although the term "Linker" implies a third party between the source of knowledge and the user of knowledge, he need not be a part of an independent organization.

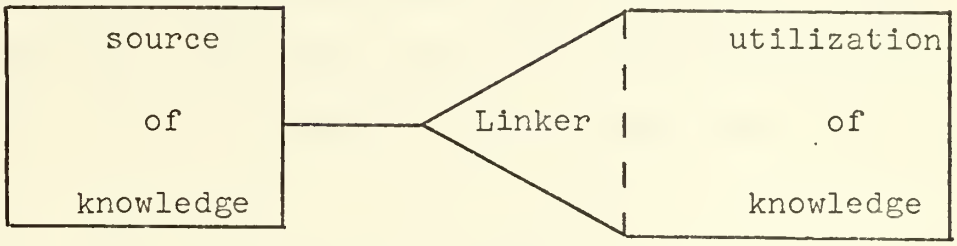


Figure 1. A Simplification of the Linking Mechanism

In fact, the Linker may come from either organization but probably operates best if he is aligned more closely with the user organization as shown in Figure 1 [Ref. 5, p. 109].

It has been established that Civil Engineering Corps Naval Officers with Linker characteristics exist and can be identified by a simple psychological questionnaire [Ref. 2]. Officers identified by the questionnaire as Linkers were personally interviewed to validate the questionnaire and make sure that the characteristics which were sought by the test were exhibited by those persons having high Linker scores. The Linker characteristics in these individuals were quite apparent when tested orally, and it was hypothesized that it would be possible to identify similar characteristics in Civilian Government Employees. Accordingly, the test for Naval officers was modified to apply to civilian

personnel of the Naval Facilities Engineering Command. Pilot tests were given to determine the reasonableness of the questionnaire.

It must be pointed out that no single question is believed to be an indicator which will identify a Linker. It is not likely that any one person will exhibit all Linker characteristics. The Linker trait is a composite of characteristics and Linkers exhibit more of them than most people do.

Another term which has been commonly used is "gatekeeper". In terms of the flow of information, a gatekeeper is the one "who holds the strategic position", [Havelock, p. 7-11]. It is not necessary for a Linker to be a gatekeeper. Although the gatekeeper may also be the formal leader, often he is informally designated by the users to fulfill an informal leadership position [Ref. 2].

IV. QUESTIONNAIRE

The Professional Preference Census of Government Service Employees was based primarily on the Professional Preference Census for Naval Officers as shown in Appendix B. A major source of information for the development of the questions was the Diffusion Documents Center at Michigan State University. Rogers and Shoemaker [Ref. 3] have analyzed approximately 1,200 empirical reports and about 300 non-empirical reports from a variety of authors and disciplines. Revisions to the Naval Officers Census were made to orient the questions toward civilian employees as well as to improve the discrimination quality of the original test. A summary of background information for each of the questions is given together with explanations for changes that were made. Complete source information for each of the original questions is given in Ref. 2]. For direct comparison the two Censuses are found in Appendix A and Appendix B.

The first question of the census for government employees is: "Indicate the type of information upon which you would place highest credibility." The question and the possible answers were taken exactly as they appeared in the Naval Officer questionnaire. The assumption was made that the Linker would be a good performer in terms of output. Research done by Massey [Ref. 6] indicates that better performing scientific and technical personnel tended to place most

reliance on information which they have stored in their own minds and second on information stored in the minds of others. Formal written communication was given the least reliability [Ref. 6, p. 57-58]. In addition, nearly sixty percent of the innovators studied by Blackwell [Ref. 7, p. 19] considered word of mouth to be the most effective source of innovations. Katz [Ref. 8, p. 77] determined that opinion leaders not only pass a great deal of information to other people, but they also obtain a large amount of information from other people. Since the characteristics of a good performer, innovator, and opinion leader are all assumed to be attributes of the Linker, question one was scored to give most weight to responses choosing personal knowledge.

Question two is: "Indicate which combination of words, when placed in the following sentence, would most accurately describe you: I feel that I hear about work-related developments _____ most of my colleagues." Possible answers ranged from "considerably before" to "sometime later". This question, along with its possible answers appeared exactly as it did in the Naval Officer questionnaire. It tried to establish the relative time required for a person to learn a new idea. It was based on the following generalization by Rogers and Shoemaker [Ref. 3, p. 189]:

(1) Earlier adopters have greater knowledge of innovations than later adopters.

The third question asks: "In the past year how many non-routine, work-related projects have been completed for

which you supplied the original idea?". Both the question and the answers remained unchanged from one census to the other. The question was designed to measure the respondents innovativeness. It was hypothesized that the number of non-routine, work-related projects would give an indication of the person's willingness to investigate and implement new ideas. The question was based on the results of interviews conducted by Creighton, Jolly, and Denning [Ref. 2].

The fourth question is: "Indicate the number of formal work-related meetings and/or conventions which you attended last year and which involved personnel other than your immediate circle of colleagues." Closely related to this question are questions ten and fourteen. Question ten is: "Indicate the number of work-related organizations to which you hold current membership". Question fourteen asks: "With whom do you have mutual work-related interests?". Two changes were made to question four. The first changed the original question from "technical and/or scientific society meetings" to "formal work-related meetings". The second change was to substitute "more than 6" for"more than the above" in the last answer. The changes broadened the scope of the question and clarified the answer. Question ten was reworded to broaden the scope of the question. Question fourteen was entirely reworded to orient both question and answer toward civilian rather than military personnel. All of the questions were worded so as to determine the same type of information. The information desired

was to measure the degree of "cosmopoliteness" in the respondent. Rogers and Shoemaker define cosmopoliteness as "the degree to which an individual's orientation is external to a particular system" [Ref. 3, p. 89]. Using this definition they make these generalizations:

(1) Earlier adopters are more cosmopolite than later adopters [Ref. 3, p. 189].

(2) Earlier knowers of innovation are more cosmopolite than later knowers [Ref. 3, p. 108].

(3) Opinion leaders are more cosmopolite than their followers [Ref. 3, p. 218].

In other research, Farr [Ref. 9, p. 10] discovered that of the qualities found in informal leaders and opinion leaders, the one which was most distinguishable from others was their "cosmopoliteness -- their general orientation towards persons and topics external to their own group. They are more likely to attend conventions, and have personal contacts with individuals outside their own group." The cosmopolite characteristic was assumed to be another characteristic of the Linker and was measured by questions four, ten, and fourteen.

Question five asks: "Given a choice of the type of work you could perform on the job, which would you choose?". Both the question and the answers were modified to improve the readability and clearness of the question. The intent was to measure "achievement motivation". Background for this question was primarily from Rogers and Shoemaker's generalizations:

(1) Earlier adopters have higher levels of achievement motivation than later adopters [Ref. 3, p. 188].

The characteristic of an early adopter, assumed also to be a characteristic of a Linker, was checked by measuring achievement motivation.

The sixth question asks: "In the past month how many times have you sought further information, other than that of a routine nature, about a new idea or ideas which you thought to be useful to your work?". This question was unchanged from the Naval Officer Census. Information is sought to determine the individual's natural desire to seek information. It is supported by the conclusions of Rogers and Shoemaker concerning early adopters.

(1) Earlier adopters seek information about innovations more than later adopters [Ref. 3, p. 189].

Question seven is a situational type question which was designed to check the respondents attitude toward borrowing. The question was changed considerably from the original question in the Naval Officer Census. This was done primarily because it was felt that the question would otherwise not be interpreted in the manner desired. The question was based on the need to find out the respondents attitude toward credit. The generalization upon which question seven was based was:

(1) Earlier adopters have a more favorable attitude toward credit (borrowing) than later adopters [Ref. 3, p. 186].

Question eight and question fifteen attempt to determine the respondents characteristics as an opinion leader. Question eight is: "Indicate the frequency with which your subordinates, peers, and/or superiors came to you in the past month for work-related information and/or advice which was not a function of your formal position". The choice of answers for this question was changed slightly from the Naval Officer Census to give a narrower range of answers. Question fifteen is: "During the last month, indicate the relative frequency with which you recommended to a colleague a specific item of interest on a work-related topic, e.g., a journal article, research report, or any information on new ways to do things". This question was slightly reworded from the previous census to improve its clarity. Both questions were based on the following conclusion:

(1) Earlier adopters have a higher degree of opinion leadership than later adopters [Ref. 3, p. 189]. Reynolds and Darden [Ref. 10, p. 449] found that opinion leaders are more receptive to information from personal sources than are people who are not opinion leaders. In addition, a review of opinion leader -- non-opinion leader interaction studies, i.e., those individuals who transmitted more frequently, also received the largest number of communications [Bales, Ref. 11, p. 2-7]. Blackwell's research found that "there seems to be no question that the first users of a product or service (innovators) are active in the word-of-mouth channel" [Ref. 7, p. 15]. All of the above research indicates that

one discriminating feature for an opinion leader or an innovator should be the person's relative frequency of reception and transmission of ideas.

Question nine is: "Indicate the total number of journals, magazines, and newspapers which you regularly read". The question is the same as the one used in the Naval Officer Census. It was based on the following propositions:

(1) Earlier adopters have greater exposure to mass media communication channels than later adopters [Ref. 3, p. 189].

(2) Earlier knowers of an innovation have more exposure to mass media channels of communication than late knowers [Ref. 3, p. 108].

(3) Opinion leaders have greater exposure to mass media than their followers [Ref. 3, p. 218].

An innovator was found to be more likely to subscribe to a larger number of magazines than the general population [Engel, et. al., Ref. 12, p. 4]. The supporting research indicated earlier adopters, early knowers (of innovation), opinion leaders, and innovators should all be distinguishable from the rest of the population by relative exposure to mass media. Question nine attempts to measure the trait.

Question eleven is: "Indicate the level within the social strata to which you would aspire to be 10 years from now". The question was unchanged from the Navy Officer Census. "Social mobility" was the trait being measured. It was felt that Linkers would be prone to anticipate and

set high goals for themselves and hence desire a high social level.

Question twelve is a situational type of question. It was designed to have the respondent project his attitude by asking for his approach to a building material problem. The question measured relative attitudes accounting for both venturesomeness and greater rationality. It was assumed that the Linker would display more venturesome characteristics than the average person. The question was the same as that used for the Naval Officer Census.

The thirteenth question asks: "Which of the following do you tend to rely upon most heavily as a source of information for work-related projects and/or problems?". This question was changed from the Naval Officers Census to make the question clearer to the respondent. The background sources which form the basis for this question are quite varied. Riley [Ref. 13, p. 544] found the "innovators -- get their ideas directly from their colleagues". It was found that better performing groups rely more on internal sources of information than external sources [Allen, Ref. 14, p. 137-153]. The following generalizations were made by Rogers and Shoemaker:

(1) Earlier adopters have greater exposure to interpersonal communication channels than later adopters [Ref. 3].

(2) Earlier knowers of an innovation have more exposure to interpersonal channels of communication than late knowers [Ref. 3, p. 108].

(3) Opinion leaders have greater exposure to mass media than their followers [Ref. 3, p. 218].

This question and the supporting research appear to be in contradiction to question nine. They suggest that a Linker would tend to place high credibility on the information from sources that are both personal and non-personal and from sources both internal and external to the organization.

This apparent conflict was resolved in the following manner by [Ref. 3, p. 132]. The "innovation-decision" process can be viewed as sequential functions:

(1) Knowledge - the individual is exposed to the innovation's existence and gains some understanding of how it functions.

(2) Persuasion - the individual forms a favorable or unfavorable attitude toward innovation.

(3) Decision - the individual engages in activities which lead to a choice to adopt or reject the innovation.

(4) Conformation - the individual seeks re-enforcement for the innovation -- decision he has made.

When this description is considered with the following generalizations the apparent discrepancy is resolved.

(1) Mass media channels are relatively more important at the knowledge function, and interpersonal channels are relatively more important at the persuasion function in the innovating decision process [Ref. 3, p. 255].

(2) Cosmopolite communication channels (channels from outside the social system being investigated) are relatively

more important at the knowledge function, and local channels are relatively more important at the persuasion function in the innovation-decision process [Ref. 3, p. 258].
The research indicates that both types of communication are important. Word of mouth communication is more important at the stage just prior to trial, but the mass media is important to stimulate an interest and awareness.

Question sixteen is a situation type question in which the respondent was asked to make a recommendation to a friend as to the type of job to choose. The question was shortened and simplified to make it more easily understood. It is directed at finding the respondents willingness to assume risk. It is based on the following generalizations:

(1) Earlier adopters have a more favorable attitude toward risk than later adopters [Ref. 3, p. 186].

The seventeenth question is: "Indicate which of the following best characterizes your approach to an innovative idea". This question is the same as the question in the Naval Officer Census. The question was based on research which showed that a venturesome person tended to be the first to innovate [Rogers and Rogers, Ref. 15, p. 30]. Similar results were reported by Politz [Ref. 16, p. 51]. Research on innovative behavior done by Robertson considered seven factors: social mobility, priviledgeness, venturesomeness, cosmopoliteness, interest polymorphism, social integration, and personality. The strongest determinant of innovative behavior was venturesomeness [Robertson, Ref. 17, p. 220].

Questions eighteen through twenty were asked to get information on the background of the respondent including present and desired government service rating, length-of-time-in-job, and a brief description of job.

V. METHODOLOGY

The sample was selected from Civilian Government Service Employees in the Naval Facilities Engineering Command. It was limited to people with ratings of GS-6 and above. Of a possible 4464 people, 2954 were selected at random to give a large but manageable sample to work with. The sample was distributed as shown in Table 1.

The questionnaire as shown in Appendix A consisted of twenty questions directed towards identifying the characteristics of a Linker. A total of 2048 were returned as shown in Table 1. Of those which were returned, 1598 were considered immediately usable, that is, the subjects answered all of the questions and in no case indicated more than one answer per question. In addition, there were 348 questionnaires which had at least one answer missing or had marked more than one answer. In these cases the answers were coded as "missing data". The remaining 102 questionnaires were unusable because they were returned totally unanswered for a variety of reasons including transfer, death, retirement, and those who declined to answer. Various possibilities for dealing with the missing values in this group were considered. Chan and Dunn [Ref. 18] compare several methods of handling missing values. They assume that the sample distributions are multivariate normal. Although the sample here did not fall into this category a comparison of the mean values for

TABLE 1

QUESTIONNAIRE DISTRIBUTION

Location Identifier	Location	Total Population	Number Mailed	Immediately Usable	Missing Data
2547085	Bangkok	23	14	7	1
2547420	Guam	53	33	19	1
2547422	Cuba	5	2	1	0
2547460	Manila	12	10	3	2
2547475	Pearl	90	63	33	3
2547500	Keflavik	7	5	3	1
2547530	Madrid	9	6	3	2
2547960	Rodman	1	0	0	0
2548035	Bermuda	1	1	0	1
2548469	Naples	1	1	1	0
2548800	San Juan	9	6	4	1
2548815	Reindeer Station	3	3	0	0
3070145	Pearl	162	95	63	7
3071131	Naples	2	2	0	0
5116500	Norfolk	99	68	34	2
5118390	Great Lakes	56	33	16	3
5118400	Guam	103	66	30	6
5118485	Newport	58	41	22	2
5118650	Pearl	98	63	38	4
5118660	Pensacola	78	43	23	3
5118800	San Diego	140	89	41	10
5118900	Subic Bay	21	13	8	0
5118925	Yokosuka	7	3	2	0
3070155	Philadelphia	375	236	106	22
3070745	San Bruno	642	417	226	55
3070055	Charleston	395	233	121	33
2506200	Davisville	155	99	14	38
3070130	Norfolk	350	219	129	20

TABLE 1 (CONT.)

Location Identifier	Location	Total Population	Number Mailed	Immediately Usable	Missing Data
2506400	Gulfport	92	58	24	8
3070950	Washington Chesapeake	431	275	106	29
2506600	Port Huenueme	582	360	189	37
3075910	Washington HQ	403	403	163	42
Returned with identification code missing:				160	35
			Totals:	1598	348

each question was determined. The means for individual questions were calculated for the missing data group (348). The means for individual questions were also calculated for a combined group consisting of both immediately usable data and missing data. Because the means were very close to each other it was felt that the populations were enough alike to assign the mean of the combined groups to places where data was missing. This tended to keep the overall mean the same but slightly reduced the standard deviation.

The questions were scored as indicated in Appendix A. Scoring was done to emphasize the particular Linker trait being tested. The range of the scoring was from one to five with five indicating the strongest Linker trait. The scores for each subject were then totaled and a mean and standard deviation determined for the total score. As was done with the Naval Officers, the separation points for the Government Service Employees five groups were placed at one and two standard deviations from the mean (Figure 2).

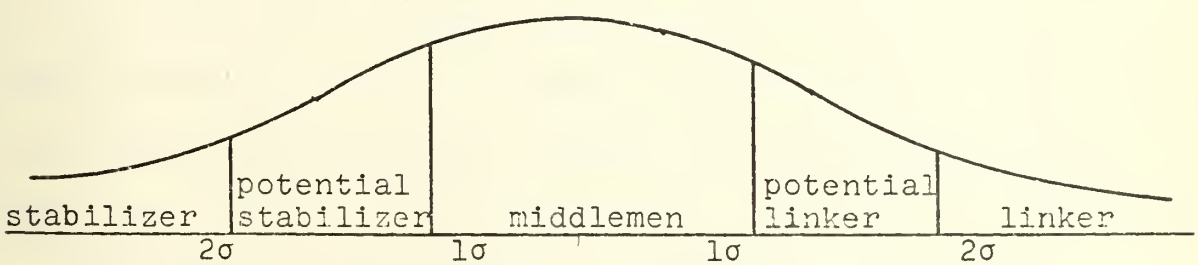


Figure 2. Categorization of a Sample Population. Linkers were those having a high score. Stabilizers were those with a low score.

Although Linker's scores were high, the high scores do not indicate that a Linker is "better" than a person with a lower score. It simply indicates the existence of the qualities that were being looked for. It should be noted that Linker qualities do not necessarily exist in top management [Ref. 2]. The qualities normally occur in individuals at many levels in the organization. The groups were arbitrarily identified as: Linkers, Potential Linkers, Middlemen, Potential Stabilizers, and Stabilizers. Because the thrust of the study was toward Linkers the other groups remained undefined except for their score rating.

The first seventeen questions were used to identify the Linkers and do the analysis on the Government Service Employees. The last three questions were not used until later in the analysis. They deal with aspiration level, length of time in the job presently assigned, and a brief description of the subjects' job. The first seventeen questions were considered, first, to separate the subjects into groups, and then, in a multivariate discriminate analysis to verify that the test could in fact discriminate between the groups. The Government Service Employees were then compared to the Naval Officers of the previous study [Ref. 2].

Although the distribution of the Government Service Employee sample was bell shaped, it was not a normal distribution. The mean of questions one through seventeen for the immediately usable sample (1598) was 48.86. The standard deviation was 8.39. The mean for questions one through

seventeen of the missing data sample (348) with the averages inserted was 49.68. The standard deviation was 7.72.

Factor analysis using the Statistical Package for Social Sciences (SPSS) [Ref. 19] was performed separately on both the immediately usable data and on the missing data samples. It was hypothesized that if the two samples were alike, then data reduction by factor analysis would be similar for each sample. Using Rao's Canonical Factoring, with oblique rotation, and the seventeen questions as variables, the immediately usable sample reduced to five significant factors and the missing data sample reduced to six significant factors.[1] The highest coefficients within each factor were then picked to determine the questions which were most important to that factor. The result was that the two samples were very much the same, that is the most important questions for factor one in the immediately usable sample were also the most important questions for factor one of the missing data sample. A similar pattern followed for the remaining factors. It was found that the factors could be easily identified with characteristics which were used in the formal Linker definition.

The closeness of the means and the Factor Analysis comparison support the claim that both the immediately usable

---

[1] The criteria used for significance was an eigenvalue greater than one.

group and the missing data group (with question averages inserted where data was missing) were essentially the same. When the two groups were combined, the mean of the Government Service Employees sample (questions one through seventeen) was 49.0. The standard deviation was 8.30. A histogram of this data is given in Appendix C.

From the previous study with Naval Officers the overall mean (questions two through eighteen) was given as 50.37 and the standard deviation as 6.73. A histogram of total scores versus frequency is given in Appendix D. The closeness of the new mean to the old mean and the similarity in the test prompted a question by question comparison of the two tests. This comparison is shown in Table 2. Since the numbering of the two tests differed for equivalent questions, comparison numbers were assigned to aid the reader in equating questions. For example, question two on the Naval Officers test is the same as question one on the Government Service test. These questions are compared in Table 5. It was decided that questions six and eight on the Naval Officers' test as appears in Appendix B were not close enough to the questions five and seven in the Government Service test as shown in Appendix A and were therefore deleted from the comparison. Question one on the Naval Officers' test and eighteen on the Government Service test were not graded in the same manner and were therefore also deleted from the comparison. With these questions deleted the means were 43.52 and 42.89 for the Naval Officer and Government Service Employees respectively.

TABLE 2

A COMPARISON BETWEEN THE

NAVAL OFFICERS PROFESSIONAL PREFERENCE CENSUS

GOVERNMENT SERVICE PROFESSIONAL PREFERENCE CENSUS

Comparison Number	Naval Officers Question Number	Government Service Question Number	Comparison between the questionnaires
	1	18	Both aspiration questions, not compared because of the difference in scoring
1	2	1	Exactly the same
2	3	2	Exactly the same
3	4	3	Exactly the same
4	5	4	Slightly modified for GS
	6	5	Similar idea, rewarded both question and answer
5	7	6	Slightly modified for GS
	8	7	Similar idea, rewarded
6	9	8	Exactly the same question scoring modified for GS
7	10	9	Exactly the same
8	11	10	Slightly modified for GS
9	12	11	Exactly the same
10	13	12	Modified for clarity
11	14	13	Modified for clarity
12	15	14	Slightly modified for GS
13	16	15	Slightly modified for clarity
14	17	16	Slightly modified for GS
15	18	17	Exactly the same

The corresponding standard deviations were 6.34 and 7.68. Histograms of revised total scores versus frequency are given in Appendices E and F.

Multivariate Stepwise Discriminant Analysis using the Biomedical Discrimination Program (BMD07M) [Ref. 20] was used to determine the ability of each test to discriminate the five designated groups from the sample population. The five groups: Linkers, Potential Linkers, Middlemen, Potential Stabilizers, and Stabilizers were determined using the total score of the test. Divisions between groups were made at one and two standard deviations from the mean dividing the sample as shown in Table 3.

TABLE 3

GROUPS DETERMINED BY MEAN AND STANDARD DEVIATION

GROUP	NAVAL OFFICERS	GS EMPLOYEES
Linkers	35	54
Potential Linkers	147	197
Middlemen	756	1121
Potential Stabilizers	178	213
Stabilizers	12	13

A linear discriminant function which best characterized the original fifteen questions was computed for each of the five groups [Cooley and Lohnes, Ref. 21]. Disregarding the

original grouping, each of the subjects scores was reevaluated using the five discriminant functions.

Based on the highest score computed by the five discriminate functions the subject was then put into one of the originally defined groups as shown in Table 4. If the discrimination had been perfect, the grouping in the matrix would have been the same as the grouping by standard deviation, that is all cases would lie on the diagonal. As in any statistical analysis the results are never perfect. One measure of how accurately the groups were able to be separated by multivariate discriminant analysis of the questionnaire results is the U-statistic, which can be translated to an F-statistic. The value of this F-statistic was highly significant at a critical value of .99 in both cases, leading to the conclusion that the test grouped the subjects very well. Because the discrimination was not perfect there are cases which are not on the diagonal. For example, using the fifteen questions from the Government Service Employees test, the multivariate analysis says that two of the original fifty-four Linkers would score equally well as Potential Linkers, and ten of the original 197 Potential Linkers would score equally as well as Linkers. The discriminant analysis then shows a total of sixty-two Linkers and 301 Potential Linkers. Plots of these groups are shown in Appendices G and H.

An F-statistic was computed for each of the questions before the first iteration in the multivariate analysis (of the entire sample) indicating the discriminating ability

TABLE 4

STATISTICAL GROUPING FOR INDIVIDUAL TESTS

GS EMPLOYEES

Groups by Multiple Discriminate Analysis

Groups By Standard Deviation	LINK	POTL	MIDD	POTS	STAB	TOTAL
LINK	52	2				54
POTL	10	187				197
MIDD		112	855	149	5	1121
POTS				196	17	213
STAB				2	11	13
TOTAL	62	301	855	347	33	

NAVAL OFFICERS

Groups by Multiple Discriminate Analysis

Groups By Standard Deviation	LINK	POTL	MIDD	POTS	STAB	TOTAL
LINK	35					35
POTL	10	137				147
MIDD		68	611	77		756
POTS				163	15	178
STAB					12	12
TOTAL	45	205	611	240	27	

of each question. It was hypothesized that equivalent questions would be consistent in their ability to discriminate on each of the tests. If the questions were equivalent, and the two sample populations answered the questions in the same manner, the ordering of the F-statistics would be the same for both tests. If the questions were not equivalent in discrimination ability or if they were not answered in the same manner by each sample, then the question should be re-examined. Table 5 shows the relationship between the two sets of ordered statistics. The comparison numbers indicate questions that were considered equivalent. The ordering in each case is similar with the exception of comparison number twelve. This comparison number corresponds to question fourteen on the Government Service test and to question fifteen on the Naval Officer test. Question fifteen was dropped from the previous Naval Officer analysis because it was not significant at a critical value of .95. It was therefore modified slightly for the Government Service test which may account for its marked increase in significance. Government Service Employees may also have tended to answer this question in a different manner from the Naval Officers.

The Multivariate Discriminant Analysis (BMD07M) was also used to determine if it was possible to discriminate between the Naval Officer test and the Government Service Employee test. The grouping was as shown in Table 6:

TABLE 5

COMPARISON OF F STATISTICS FOR

NAVAL OFFICERS AND GOVERNMENT SERVICES EMPLOYEES

NAVAL OFFICERS				GS EMPLOYEES	
Census Question Number	F Statistic	Comparison Number	Comparison Number	F Statistic	Census Question Number
16	118.8101	13	13	187.3004	15
4	103.4482	3	5	183.5557	6
7	100.8159	5	6	163.7592	8
10	78.1956	7	3	149.7864	3
9	59.3115	6	4	142.0060	4
3	45.0746	2	7	122.6772	9
11	43.7248	8	12	98.1528	14
5	41.9300	4	8	74.6702	10
12	30.4906	9	2	73.3462	2
2	27.7659	1	9	42.8983	11
18	19.3165	15	14	26.8916	16
17	10.9672	14	1	26.1745	1
13	9.9934	10	15	18.6802	17
*15	9.2755	12	11	15.3463	13
*14	4.5452	11	10	11.8560	12

The numbering of the questions on the two tests was not the same. For clarity, comparison numbers were assigned to indicate questions which were either identical or nearly identical on the two tests.

*Not statistically significant at a critical value of .95.

TABLE 6

CENSUS GROUPS DETERMINED BY THE SAMPLE SIZE

NAVAL OFFICERS	GOVERNMENT SERVICE EMPLOYEES
1128	1946

The computed matrix as given in Table 7 shows very little discrimination.

TABLE 7

STATISTICAL SUMMARY OF DISCRIMINATION BETWEEN CENSUS GROUPS

	NAVOFF	GS
NAVOFF	776	352
GS	598	1348

The above data is plotted in Appendix I and also shows almost no discrimination between the two censuses. The two sample populations appear to be very much alike on the basis of their answers.

Aspiration level was considered as a possible indicator for a Linker. It was hypothesized that the Linker would tend to aspire to a higher level than would a Stabilizer or a Middleman. In order to check this, the scoring system in Table 8 was set up to check question eighteen.

If the subject was presently a GS-6 and aspired to GS-6, he was given a score of 1. If he was at GS-6 and aspired to

TABLE 8

Scoring Chart for Question Eighteen

GOVERNMENT SERVICE GRADE ASPIRATION LEVEL	6	7	8	9	10	11	12	13	14	15	16	17	18
18	5	5	5	5	5	5	5	5	5	5	5	5	5
17	5	5	5	5	5	5	5	5	5	5	5	5	
16	5	5	5	5	5	5	5	5	4	4	4		
15	5	5	5	5	5	5	4	4	3	3			
14	5	5	5	5	4	4	3	3	3				
13	5	5	4	4	3	3	3	3					
12	5	4	3	3	3	2	2						
11	4	3	2	2	2	1							
10	3	2	2	1	1								
9	2	2	1	1									
8	2	1	1										
7	2	1											
6	1												

PRESENT GOVERNMENT SERVICE GRADE LEVEL

Note: Numbers shown in boxes represent scores given.

GS-12, he was scored 5. The score started at a higher level if the subject had already attained a fairly substantial position. There was a distinct difference between the Linkers and the Stabilizers in this characteristic. Eighty-seven percent of the Linkers showed aspiration levels of three or above while seventy-seven percent of the stabilizers showed aspiration levels of two or below.

There was some thought that the Government Service Employee who was a Linker might be distinguishable by the amount of time that he had been in his present position. Accordingly, the time in position for Linkers was compared to the time in position for Stabilizers. There was no discernible difference. The Linkers and Potential Linkers were combined and plotted in Appendix J and compared to a plot of Potential Stabilizers and Stabilizers in Appendix K. They show essentially no difference in the time which personnel have been in their present position.

VI. CONCLUSIONS

The thrust of this work has been to examine a sample of the Government Service Employees in the Naval Facilities Engineering Command using a previously developed psychological test. Within the Naval Facilities Engineering Command the Linkers in the Government Service Employee sample were identified and compared to the Linker Naval Officers. Discriminant analysis showed that it was not possible to distinguish between the two tests.

Linkers tended to have a higher aspiration level than did Stabilizers. There was apparently no connection between a Linker and the amount of time he has worked in his present position.

The results of the tests showed that individuals which fit the definition of a Linker could be identified. It is believed that knowledge of the Linker concept can be used in several ways. It may be possible to train people to be Linkers and thus enhance both the quantity and quality of information passed from supplier to user. Secondly, it may be possible to better use the Linkers already existing in organizations such as the Naval Facilities Engineering Command in a more efficient manner by repositioning them in the organization or by exposing them to a greater amount of information. In effect these Linkers would become communicators of the ideas for the benefit of the organization.

There was some indication that Linkers in the two groups studied reached Linker qualifying scores through different channels as evidenced in Table 5. No analysis was made of this possibility in this study. However, pursuit of it might give better understanding of information transfer processes between civilian and military personnel in the Command. It would also be advantageous to investigate the identification of Linkers through some independent measure. Consideration has been or might be given to supervisor/subordinate evaluation and to peer evaluation.

APPENDIX A

GOVERNMENT SERVICE EMPLOYEE

PROFESSIONAL PREFERENCE CENSUS

Please circle the letter which most nearly describes your answer or reaction to the question.

1. Indicate the type of information upon which you would place highest credibility.

   a) Personal knowledge
   b) Associated staff
   c) Vendors and/or trade councils
   d) Literature - journals, books, etc.
   e) Analysis and experimentation

2. Indicate which combination of words, when placed in the following sentence, would most accurately describe you:
   I feel that I hear about new work-related developments _____ most of my colleagues.

   a) considerably before
   b) sooner than
   c) at about the same time as
   d) later than
   e) sometime later

3. In the past year, how many nonroutine, work-related projects have been completed for which you supplied the original idea?

   a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

4. Indicate the number of formal work-related meetings and/or conventions which you attended last year and which involved personnel other than your immediate circle of colleagues.

   a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than 6

5. Given a choice of the type of work you could perform on the job, which would you choose?

   a) a project with multiple solution methods and a broad range of possible objectives.
   b) a project with a specific objective but alternative solution methods.
   c) a pre-defined non-routine assignment.
   d) a challenging assignment in which the alternatives and objectives are determined primarily by you.
   e) a pre-defined routine assignment.

6. In the past month how many times have you sought further information, other than that of a routine nature, about a new idea or ideas which you thought to be useful to your work?

   a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

7. For the past 2 years a very close friend has had a strong desire to take a vacation in a foreign country. The trip will cost about $2000. He can leave anytime within the next year and could save $2000 or more in a year. What would you advise him to do?

   a) Charge the entire trip on credit.
   b) Save for 3 months with the balance credit.
   c) Save for 6 months with the balance credit.
   d) Save for 9 months with the balance credit.
   e) Save for 1 year and pay cash for the entire trip.

8. Indicate the frequency with which your subordinates, peers, and/or superiors came to you in the past month for work-related information and/or advice which was not a function of your formal position.

   a) 1-3 b) 4-7 c) 8-11 d) 11-15 e) More than the above.

9. Indicate the total number of journals, magazines, and newspapers which you regularly read:

   a) 1-2 b) 3-4 c) 5-6 d) 7-8 e) More than the above

10. Indicate the number of work-related organizations to which you hold current membership.

    a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

11. Indicate the level within the social strata to which you would aspire to be 10 years from now.

    a) Upper
    b) Lower-Upper
    c) Upper-Middle
    d) Middle
    e) Lower-Middle

12. Mr. C., a civil engineer, who is employed by a medium sized construction firm recently learned of a new building material which is used extensively in Europe but never adopted in the United States. The building material appears to have several advantages in terms of substantial cost reduction, superior insulation qualities, and

relative ease of construction as compared to its counter part in the United States.

After a thorough investigation, Mr. C. obtained extensive and reliable information on the characteristics, costs, and advantages of new material. Further, his company could easily obtain exclusive manufacturing rights for use in the United States.

Imagine that you are Mr. C. Indicate which of the following would best describe your approach to the building material.

a) Recommend that the new idea be utilized in the firm's next major building project so as to take advantage of the substantial cost savings.
b) Recommend that the building material be used in one of the firm's small, local building projects as as to test its acceptance.
c) Recommend that the firm construct a non-commercial prototype.
d) Recommend that the firm engage the services of an independent consultant.
e) Recommend that the firm wait until the building material has received considerable commercial application in the United States.

13. Which of the following do you tend to rely upon most heavily as a source of information for work-related projects and/or problems.

a) Literature
b) Sales representatives
c) Personal experience
d) Colleagues
e) Sources external to your organization

14. With whom do you have mutual work-related interests?

a) Fellow workers.
b) People doing similar work outside your organization.
c) Community associates.
d) Several groups in your locale.
e) Many groups, not necessarily in the same geographical area.

15. During the last month, indicate the relative frequency with which you recommended to a colleague a specific item of interest on a work-related topic, e.g., a journal article, research report, or any information on new ways to do things.

a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above.

16. Assume that for some reason a very close friend is forced to find another job. Some of the companies he has contacted are new and although their future success is uncertain, they offer potential salaries above that which he is now receiving. Indicate which company you would advise your friend to join.

	CHANCES FOR COMPANY SUCCESS	PROSPECTIVE SALARY INCREASE
a)	2 in 10	200%
b)	4 in 10	100%
c)	6 in 10	50%
d)	8 in 10	25%
e)	Survival Guaranteed	0%

17. Indicate which of the following best characterizes your approach to an innovative idea:

a) Very eager to adopt new ideas.
b) Discreet use of new ideas.
c) Deliberate for sometime before adopting a new idea.
d) Skeptical and cautious about adopting a new idea.
e) Prefer to only use proven ideas.

18. What is your present position/GS rating? _____
To what position/GS rating do you aspire? _____

19. How long have you worked at the job to which you are presently assigned? _____

20. Give a brief description of the nature of your job.

APPENDIX A (CONT.)

Scoring for Government Service Employee Professional Preference Census:

Question	Number of Points				
	a	b	c	d	e
1	5	4	3	2	1
2	5	4	3	2	1
3	1	2	3	4	5
4	1	2	3	4	5
5	4	3	2	5	1
6	1	2	3	4	5
7	5	4	3	2	1
8	1	2	3	4	5
9	1	2	3	4	5
10	1	2	3	4	5
11	5	4	3	2	1
12	5	4	3	2	1
13	2	3	1	4	5
14	1	2	3	4	5
15	1	2	3	4	5
16	5	4	3	2	1
17	5	4	3	2	1

APPENDIX B

NAVAL OFFICER

PROFESSIONAL PREFERENCE CENSUS

1. Assuming that you were to make the Navy a career, what would be the highest rank to which you would aspire?

   a) Lieutenant Commander
   b) Commander
   c) Captain
   d) Rear Admiral
   e) Admiral

2. Indicate the type of information upon which you would place highest credibility.

   a) Personal knowledge
   b) Associated staff
   c) Vendors and/or trade councils
   d) Literature-journals, books, etc.
   e) Analysis and experimentation

3. Indicate which word, when placed in the following sentence, would most accurately describe you: I feel that I hear about new work-related developments in my professional area _____

   a) considerably before
   b) sooner than
   c) at about the same time
   d) later than
   e) sometime after

4. In the past year, how many nonroutine, work-related projects have been completed for which you supplied the original idea?

   a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

5. Indicate the number of technical and/or scientific society meetings and/or conventions which you attended last year which involved personnel other than your immediate circle of colleagues.

   a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

6. When you are on the job, do you most prefer work that is:

   a) concerned with accomplising a specific task
   b) concerned with attempting to solve a challenging but not specifically assigned task

c) concerned with accomplishing those tasks for which I am individually responsible
d) concerned with the efficient utilization of resources
e) none of the above

7. In the past month how many times have you sought further information about a new idea or ideas which you thought to be useful to your work?

a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

8. Mr. E., a civil engineer, who is married and has three children recently decided to perform some major improvements upon his house (cost approximately $1,000). Mr. E. realized that the improvements were not urgently required but would make life at home more comfortable for the E. family. Consequently, Mr. E. was faced with a decision as to how he should finance the home improvements because such seemed to be the sole determinant as to when the E's could utilize these improvements. Indicate which of the following financial decisions you would advise Mr. E., to make for his home improvements.

a) Borrow the necessary money immediately at 18% annual interest.
b) Save for 6 months and borrow the remainder at 10% annual interest.
c) Save for one year and borrow the remaining at 7% annual interest.
d) Save for two years and pay cash for the improvements if present interest rates remain the same.
e) Make no improvements.

9. Indicate the frequency with which your subordinates, peers, and/or superiors came to you in the past month for work-related information and/or advice which was not a function of your formal position.

a) 1-3 b) 4-9 c) 10-15 d) 16-20 e) More than the above.

10. Indicate the total number of journals, magazines, and newspapers which you regularly read:

a) 1-2 b) 3-4 c) 5-6 d) 6-8 e) More than the above

11. Indicate the number of technical, scientific, and/or professional societies to which you hold current membership.

    a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

12. Indicate the level within the social strata to which you would aspire to be 10 years from now.

    a) Upper
    b) Lower-Upper
    c) Upper-Middle
    d) Middle
    e) Lower-Middle

13. Mr. C., a civil engineer, who is employed by a medium sized construction firm recently learned of a new building material which is used extensively in Europe but never adopted in the United States. The building material appears to have several advantages in terms of substantial cost reduction, superior insulation qualities, and relative ease of construction as compared to its counter part in the United States.

    After a thorough investigation, Mr. C. obtained extensive and reliable information on the characteristics, costs, and advantages of the new material. Further, his company could easily obtain exclusive manufacturing rights for use in the United States.

    Imagine that you are Mr. C. Indicate which of the following would best describe your approach to the building material.

    a) Recommend that the new idea be utilized in the firm's next major building project so as to take advantage of the substantial cost savings.
    b) Recommend that the building material be used in one of the firm's small, local building projects so as to test its acceptance.
    c) Recommend that the firm construct a non-commercial prototype.
    d) Recommend that the firm engage the services of an independent consultant firm so as to verify the information obtained and to test market acceptance.
    e) Recommend that the firm wait until the building material has received considerable commercial application in the United States.

14. In your experience, which of the following do you tend to rely most heavily upon as a source of technical information for work-related projects and/or problems?

    a) Literature-books, government manuals, and professional trade and technical journals.
    b) Vendors-representatives of, or documentation generated by suppliers or potential suppliers.
    c) Personal experience-ideas which were previously used by yourself in similar situations and recalled directly from memory.
    d) Staff-selected members of your staff who are not assigned directly to the project being considered.
    e) External sources-sources which do not fall into any of the above categories.

15. Indicate the group of people to whom you primarily relate.

    a) Officers within your specialized field.
    b) Work-related colleagues (both military and civilian).
    c) Community associates.
    d) I have a primary reference group but it is people other than those listed above.
    e) I do not have a primary reference group.

16. During the last month, indicate the relative frequency with which you recommended a specific item of interest, e.g., journal article, research report, or a lead to either to a colleague which dealt with a work-related topic.

    a) 0 b) 1-2 c) 3-4 d) 5-6 e) More than the above

17. Mr. A., a middle management executive, who is married and has one child, has been working for a corporation since graduation from college five years ago. He is assured of a lifetime job with a modest, though adequate, salary, and liberal pension benefits upon retirement. On the other hand, it is very unlikely that his salary will increase much before he retires. While attending a convention, Mr. A. is offered a job with a small, newly founded company which has a highly uncertain future. The new job would pay more to start and would offer the possibility of a share in the ownership if the company survived the competition of the larger firms.

    Imagine that you are advising Mr. A. Listed below are several probabilities or odds of the new company's proving financially sound.

Please check the lowest probability that you would consider acceptable to make it worthwhile for Mr. A. to take the new job.

a) The chances are 1 in 10 that the company will prove financially sound.
b) The chances are 3 in 10 that the company will prove financially sound.
c) The chances are 5 in 10 that the company will prove financially sound.
d) The chances are 7 in 10 that the company will prove financially sound.
e) The chances are 9 in 10 that the company will prove financially sound.

18. Indicate which of the following best characterizes your approach to an innovative idea:

a) Very eager to adopt new ideas
b) Discreet use of new ideas
c) Deliberate for sometime before adopting a new idea
d) Skeptical and cautious about adopting a new idea
e) Prefer to only use proven ideas

19. Biographical data.

a) Please indicate the type of organization you are working in at the time.

_____

b) Please indicate the title of your billet and present rank. _____
c) How many years have you held your present rank? ____
d) How many years did you hold your previous rank? ____

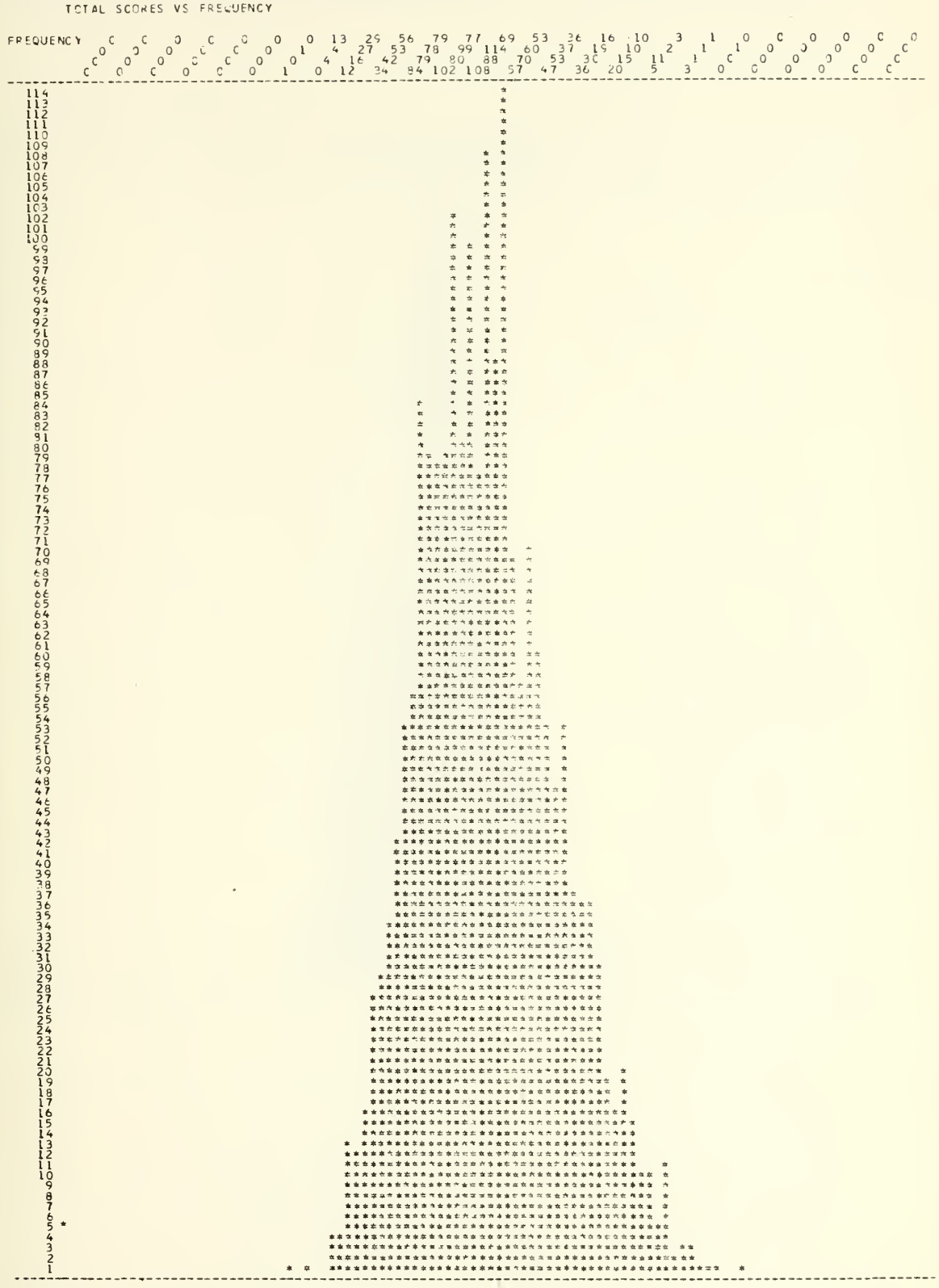
APPENDIX B (CONT.)

Scoring for Naval Officer Professional Preference Census:

Question	Number of Points				
	a	b	c	d	e
1	1	2	3	4	5
2	5	4	3	2	1
3	5	4	3	2	1
4	1	2	3	4	5
5	1	2	3	4	5
6	2	5	3	4	1
7	1	2	3	4	5
8	5	4	3	2	1
9	1	2	3	4	5
10	1	2	3	4	5
11	1	2	3	4	5
12	5	4	3	2	1
13	5	4	3	2	1
14	2	3	1	4	5
15	1	2	3	4	5
16	1	2	3	4	5
17	5	4	3	2	1
18	5	4	3	2	1

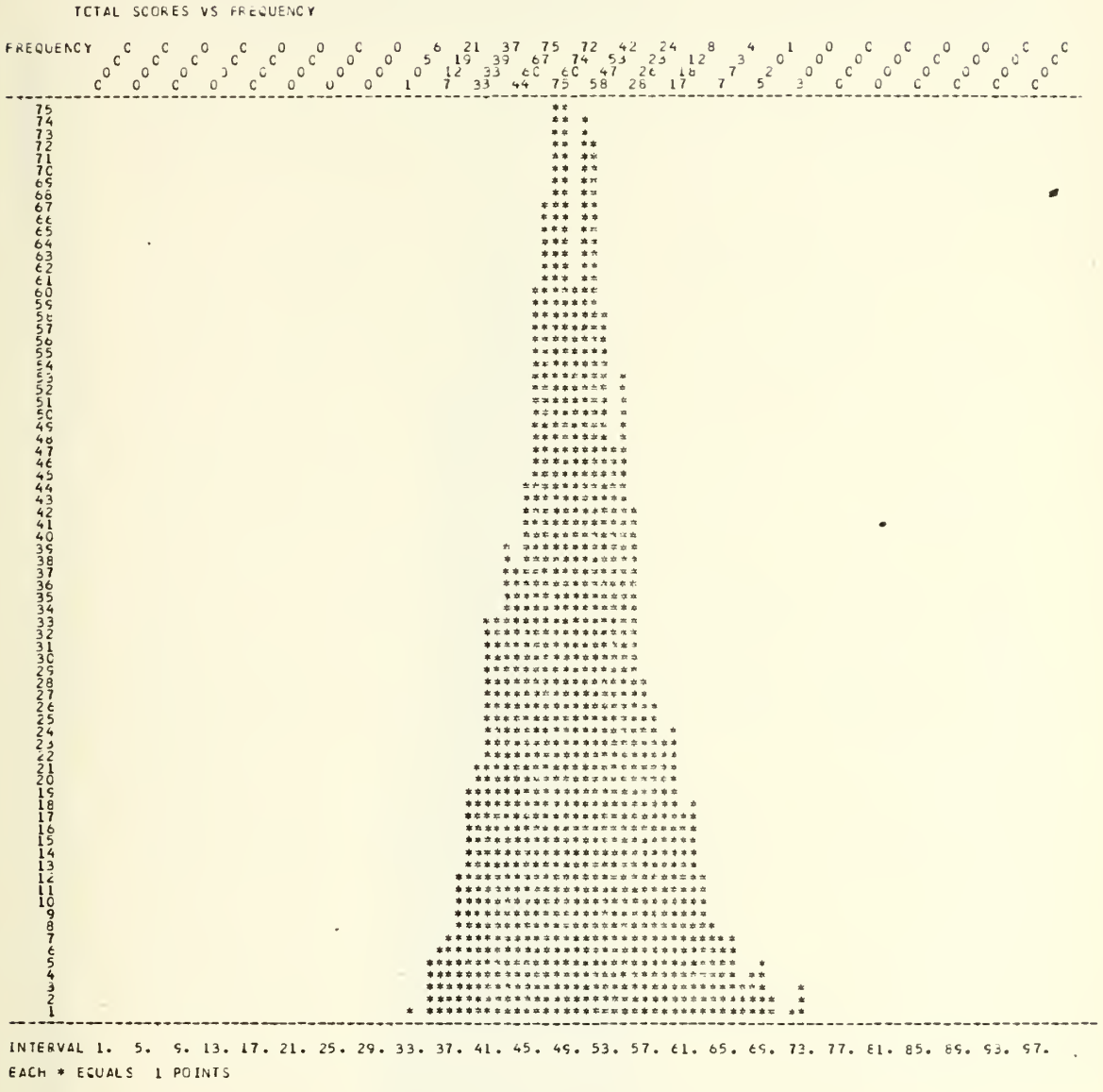
APPENDIX C

Histogram of Government Service Employees (1946), Questions 1-17



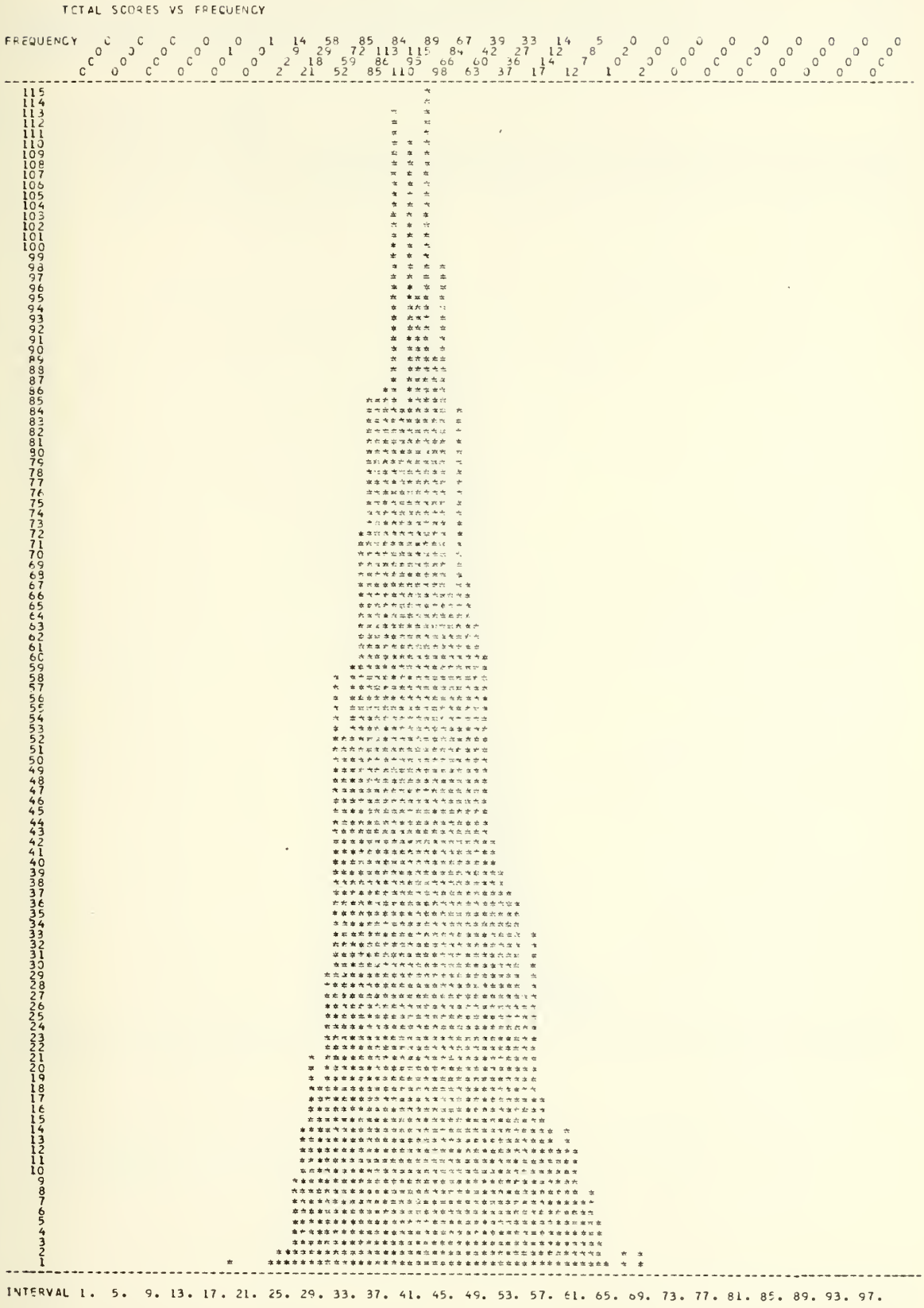
APPENDIX D

Histogram of Naval Officers (1128), Questions 2-18



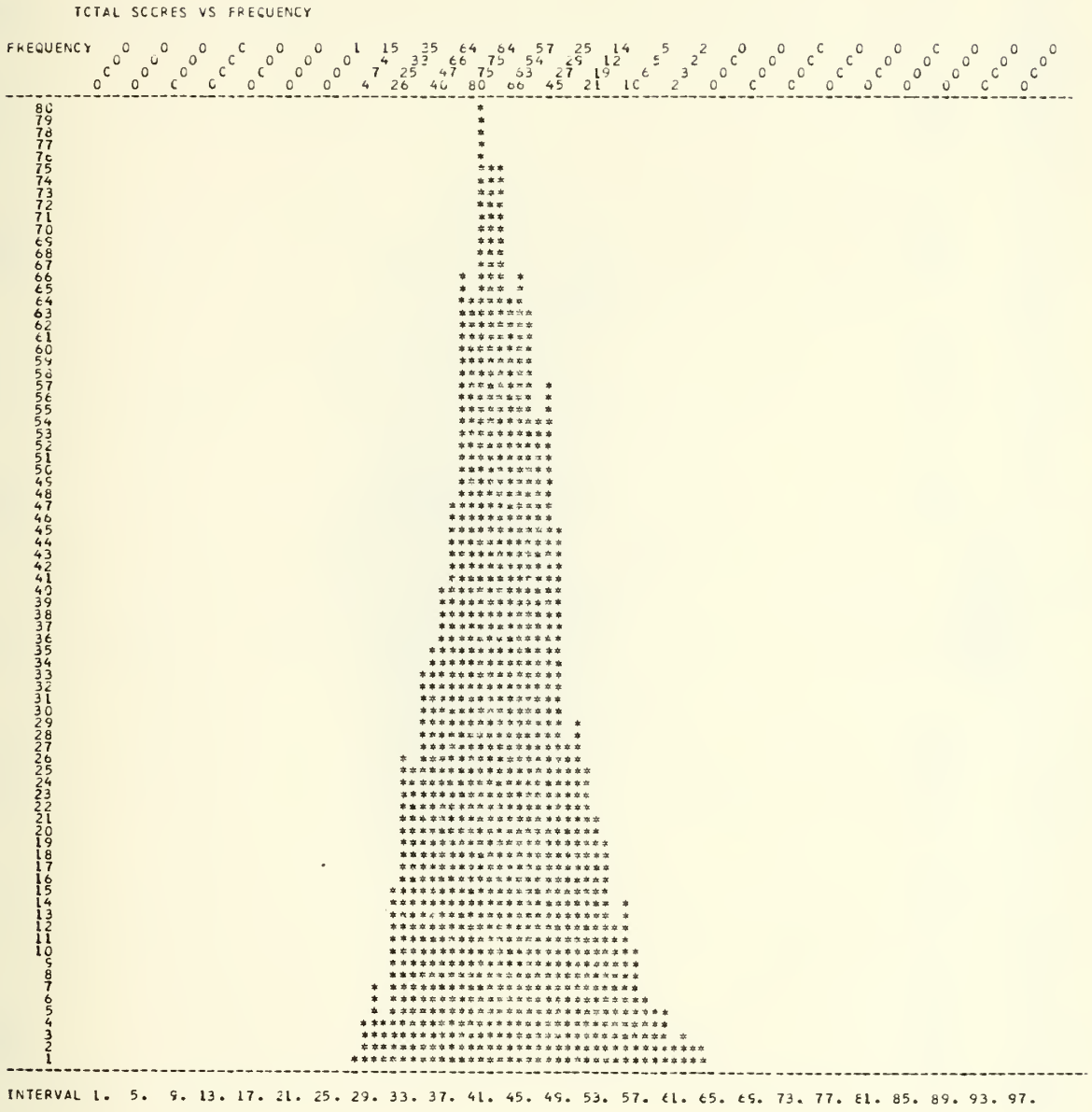
APPENDIX E

Histogram of Government Service Employees (1946), Questions 1-4, 6, 8-17



APPENDIX F

Histogram of Naval Officers (1128), Questions 2-5, 7, 9-18

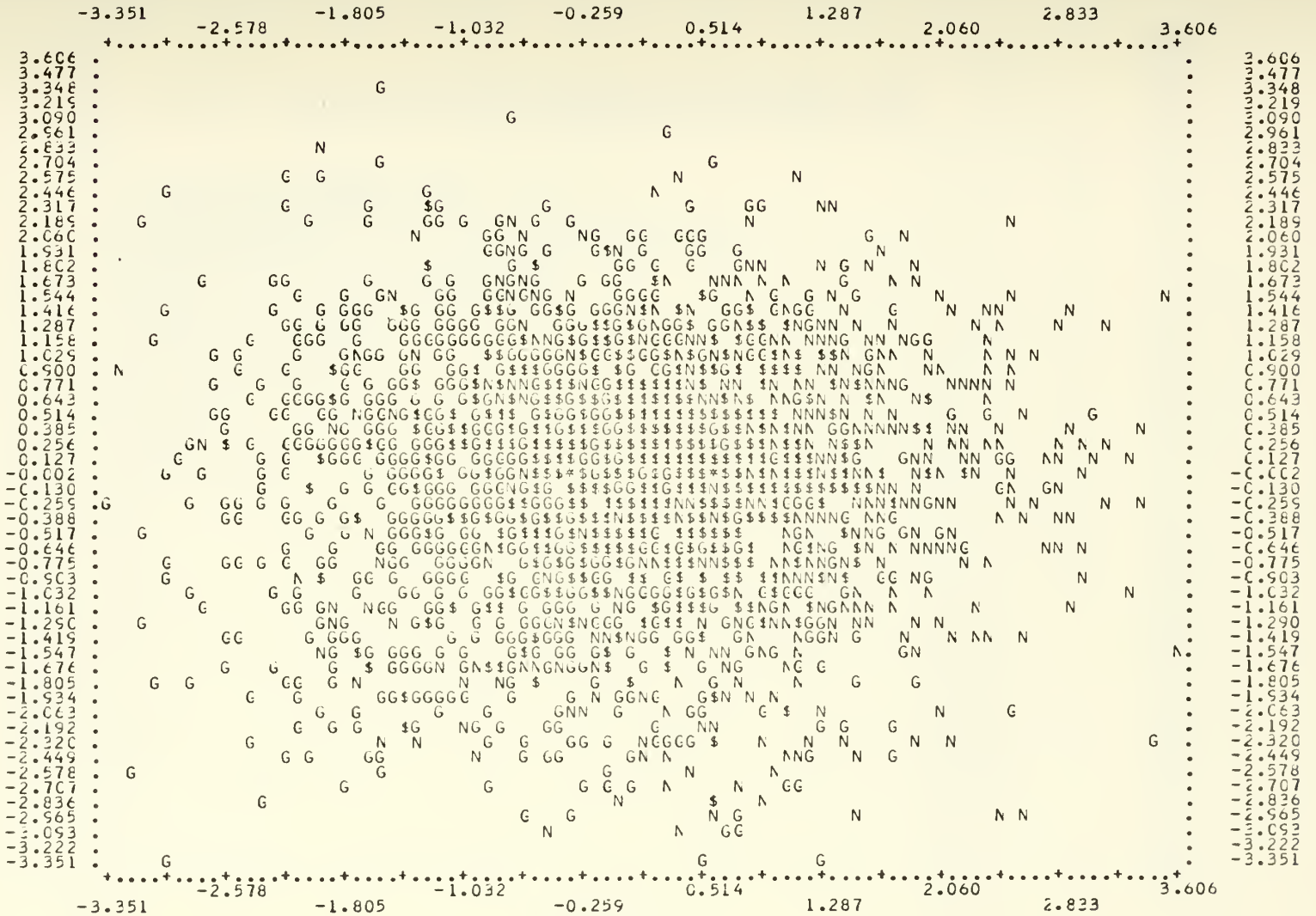


APPENDIX G

This plot graphically illustrates the ability of the 15 questions to separate the give groups for the GS Employees. The groups are designated from left to right as Stabilizers (S), Potential Stabilizers (P), Middlemen (M), Potential Linkers (P), and Linkers (L). * indicates the group mean, $ indicates overlap.

APPENDIX H

This plot graphically illustrates the ability of the 15 questions to separate the five groups for the Naval Officers. The groups are designated from left to right as Stabilizers (S), Potential Stabilizers (P), Middlemen (M), Potential Linkers (P), and Linkers (L). * indicates the group mean, $ indicates overlap.

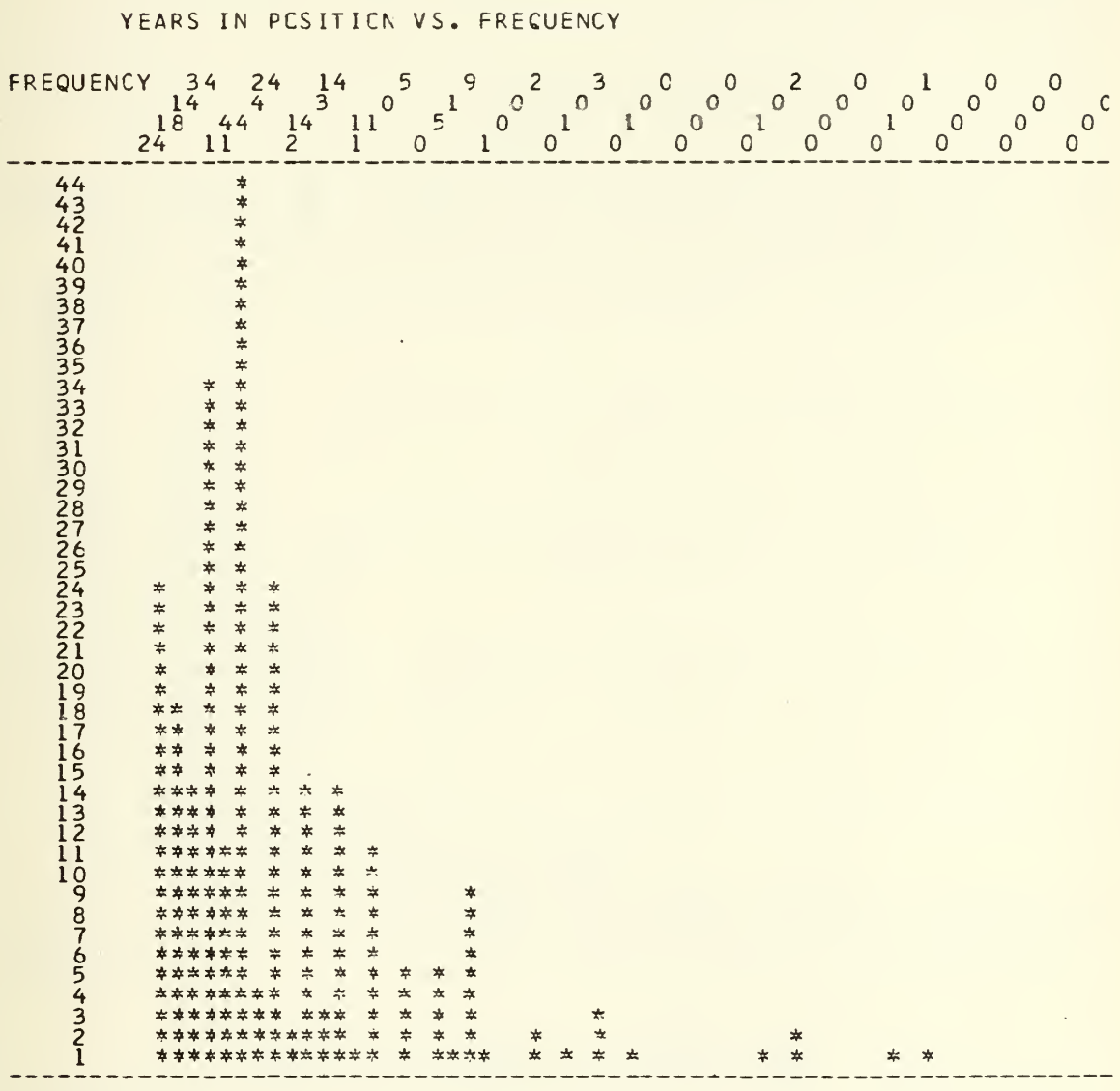


APPENDIX I

The plot graphically illustrates that the 15 questions were not able to discriminate between the Naval Officer group and the Government Service group. The groups are designated from left to right as Stabilizers (S), Potential Stabilizers (P), Middlemen (M), Potential Linkers (P), and Linkers (L). * indicates the group mean, $ indicates overlap.

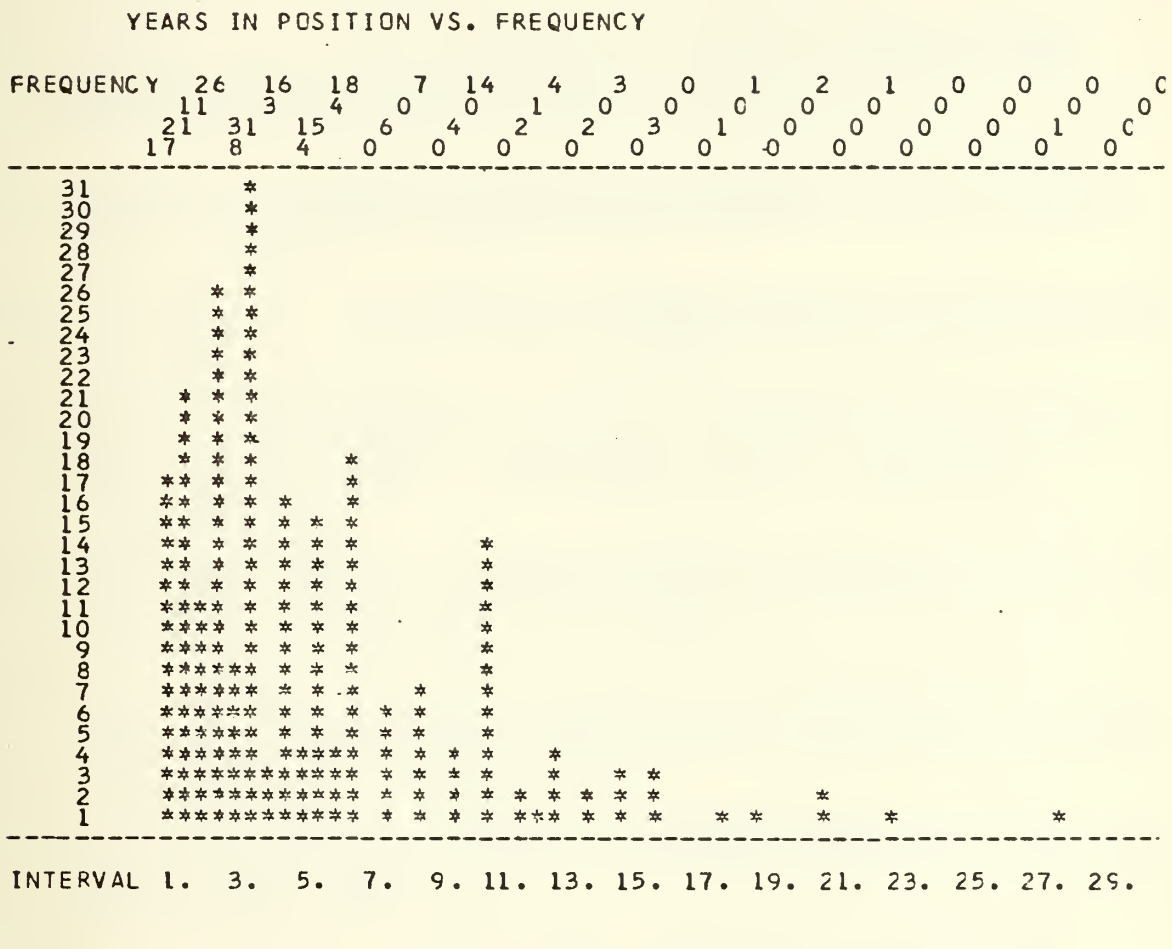
APPENDIX J

Number of Government Service Linkers and Potential Linkers Plotted Against the Number of Years in present rank.



APPENDIX K

Number of Government Service Stabilizers and Potential Stabilizers Plotted Against the Number of Years in Present Rank.



Number of years in present rank

LIST OF REFERENCES

1. Havelock, R.G., and Benn, K.D., "An Exploratory Study of Knowledge Utilization," in G. Watson, Concepts for Social Change, Washington, D.C.: NTL Institute for Applied Behavioral Science, 1967.

2. Naval Facilities Engineering Command, work request No. P.O. 1-0028, NC 2053, Enhancement of Research and Development Output Utilization Efficiencies: Linker Concept Methodology in the Technology Transfer Process, by J.W. Creighton, J.S. Jolly, and S.A. Denning, 30 June, 1973.

3. Rogers, E.M., and Shoemaker, F. Floyd, Communication of Innovation: A Cross-Cultural Approach. New York: Free Press of Glenco, 1971.

4. National Aeronautics and Space Administration, NASA, SP-5067, Assessing Technology Transfer, by R.L. Lesher, and G.J. Howick, October, 1966.

5. Doctors, S.I., The Role of Federal Agencies in Technology Transfer, The M.I.T. Press, 1969.

6. Massey, "Information Requirements for Contract Defense Mission-Oriented Basic Research Investment Decision," Ph.D. dissertation. Washington, D.C.: American University 1967.

7. Blackwell, Roger D., "Word-of-Mouth Communication by the Innovator," Journal of Marketing, XXXIII (July 1969), p. 19.

8. Katz, Elihu, "The Two Step Flow of Communications: An Up-to-Date Report on an Hypothesis," The Public Opinion Quarterly, XXI (Spring, 1957), p. 77.

9. Farr, Richard S., "Knowledge Linkers and the Flow of Educational Information," an unpublished paper, Stanford University, 1969.

10. Reynold, Fred D. and Darden, William E., "Mutually Adoptive Effects of Interpersonal Communication," Journal of Marketing Research, VIII (November, 1971), p. 449.

11. Bales, R.F., et.al., "Channels of Communication in Small Groups," American Sociological Review, XVI (June 1963), pp. 2-7.

LIST OF REFERENCES (CONT.)

12. Engle, James F., Blackwell, Roger D., and Kegerries, Robert J., "How Information is used to Adopt an Innovation," Journal of Advertising Research, IX (September, 1969), p. 4.

13. Riley, John W., Jr. and Riley, Matilda W., "Mass Communication and the Social System," in Robert K. Menton, et. al. Sociology Today: Problems and Prospects, New York: Basic Books, 1959.

14. Allen, Thomas J., "Performance of Information Channels in the Transfer of Technology," Industrial Management Review, VIII (1966), pp. 87-98.

15. Rogers, Everett, and Rogers, L. Edna, "A Methodological Analysis of Adoptions Scales," Rural Sociology, XXVI (1961), p. 330.

16. Politz, Alfred, A 12-Month's Study of Better Homes and Gardens Readers. Des Moines, Iowa: Meredith Publishing Co., 1956.

17. Robertson, Thomas S., An Analysis of Innovative Behavior and Its Determinants. Ann Arbor: University of Michigan, 1967.

18. Chan, L.S. and Dunn, O.J., "The Treatment of Missing Values in Discriminant Analysis-I. The Sampling Experiment," Journal of the American Statistical Association, V. 67, p. 473-477, June, 1972.

19. Nie, N.H., and Bent, D.H., and Hull, C.H., Statistical Package for the Social Sciences, McGraw-Hill, 1970.

20. Dixon, W.J., Biomedical Computer Programs, 2d. ed., University of California Press, 1971.

21. Cooley, W.W. and Lohnes, P. R., Multivariate Data Analysis, John Wiley and Sons, 1971.

BIBLIOGRAPHY

Bell, W.E., "Consumer Innovators: A Unique Market for Newness," in Proceedings of the Winter Conference of the American Marketing Association, New York 1963.

Coleman, James, Katz, Elihu, and Mensel, Herbert, "The Diffusion of an Innovation Among Physicians," Sociometry, Vol. 20 (December, 1957), pp. 253-270.

Gilmore, John S., "The Environment and the Action in Technology Transfer: 1970-80," in a Report of Conference sponsored by Denver Research Institute, University of Denver called Snowmass-at-Aspen, Sept. 26-28, N "70-26339, 1969.

Havelock, R.C., et. al., Planning for Innovation Through Dissemination of Utilization of Knowledge, Ann Arbor, Michigan: Institute for Social Research, University of Michigan, 1971.

Havelock, R.G., "Linking Research to Practice: What Role for the Linking Agent?", paper presented at the American Educational Research Association Meeting, New York, February, 1967.

Havelock, R.G., A Bibliography on Knowledge Utilization and Dissemination, Ann Arbor, Michigan; Institute for Social Research, University of Michigan, 1971.

Roberts, Edward B., "Entrepreneurship and Technology", in William H. Gruber and Donald G. Marquis, (ed.) Factors in the Transfer of Technology, Cambridge, Mass: M.I.T. Press, 1969.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Documentation Center Cameron Station Alexandria, Virginia 22314	2
2.	Chief of Naval Personnel Pers. 11b Department of the Navy Washington, D.C., 20370	1
3.	Naval Postgraduate School Department of Operations Research/ Administrative Sciences Monterey, California, 93940	1
4.	Library, Code 0212 Naval Postgraduate School Monterey, California, 93940	2
5.	Professor J.W. Creighton, Code 55CF Department of Operations Research/ Administrative Sciences Monterey, California, 93940	1
6.	LT. J.R. Capra, USN, Instructor, Code 55ZM Department of Operations Research/ Administrative Sciences Monterey, California, 93940	1
7.	LCDR. Steven H. Claassen, USN 15908 Vincennes Street Sepulveda, California, 91343	1
8.	Professor J. Jolly, Code 55Jo Department of Operations Research/ Administrative Sciences Monterey, California, 93940	1

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Technology Transfer as Applied to Government Service Employees of the Naval Facility Engineering Command and Compared to Naval Officers of the Civil Engineering Corps		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis; September 1973 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Steven Hurley Claassen		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		12. REPORT DATE September 1973 13. NUMBER OF PAGES 65
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)* Naval Postgraduate School Monterey, California 93940		15. SECURITY CLASS. *(of this report)* Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Technology Transfer
Gatekeepers
Linkers
Transfer of Technical Information

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

It is hypothesized that there is a relationship between the efficient utilization of research and development, and the behavioral characteristics of individuals in an organization which uses the research. A modified version of a previously developed psychological test for Naval Officers is used to determine the natural ability of Government Service Employees of the Naval Facilities Engineering Command to transfer technical

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601 |
(Page 1)

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

(20.)
information and bring about its adoption. Emphasis is placed on locating and understanding these individuals to improve the efficiency of technology transfer. A comparison is made between the Government Service Employees queried and the previously tested Naval Officers.

Thesis 146873
C4794 Claassen
c.1 Technology transfer as applied to Government Service Employees of the Naval Facility Engineering Command and compared to Naval Officers of the Civil Engineering Corps.

5 AUG 74 23091
3 FEB 77
20 JAN 86 30706

Thesis 146873
C4794 Claassen
c.1 Technology transfer as applied to Government Service Employees of the Naval Facility Engineering Command and compared to Naval Officers of the Civil Engineering Corps.

thesC4794
Technology transfer as applied to Govern
3 2768 001 02592 7
DUDLEY KNOX LIBRARY